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ABSTRACT

Reported were two studies designed to clarify the effects of verbal elaboration on children's learning. Study I was undertaken to replicate, with controlled training times, an earlier investigation of the effects of three types of extended verbal elaboration (sentences, semantic paragraphs, and syntactic paragraphs). Trials to criterion analyses of data from 42 children (aged 5 to 7) replicated previous studies: Ss in both paragraph groups performed significantly better than sentence condition Ss. Analyses of first trial errors, however, failed to find significant differences between the sentence and syntactic paragraph groups. Study II was designed to confirm earlier findings regarding the relative effects of labels and paragraphs on learning in very young

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VERBAL ELABORATION IN CHILDREN: VARIATIONS IN PROCEDURES AND DESIGN[1]

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Research, Development and Demonstratin Center
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Minneapolis, Minnesota

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TECHNICAL REPORTS

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in Education of Handicapped Children
University of Minnesota
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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

The long term objective of the Center is to improve the language and communication abilities of handicapped children by means of identification of linguistically and potentially linguistically handicapped children, development and evaluation of intervention strategies with young handicapped children and dissemination of findings and products of benefit to young handicapped children.

Abstract

Two studies were designed to clarify the effects of verbal elaboration in children. The first study was undertaken to replicate, with controlled training times, an earlier investigation of the effects of three types of extended verbal elaboration. Forty-two children from 5 to 7 years of age were tested following training with either Sentences, Semantic paragraphs, or Syntactic paragraphs. Trials to criterion analyses replicated previous studies: Subjects in both paragraph groups performed significantly better than Sentence condition subjects. Analyses of first trial errors, however, failed to find the difference between the Sentence and Syntactic paragraph groups significant. Study II was designed to confirm earlier findings regarding the relative effects of labels and paragraphs in very young children when training times were strictly controlled. Eight nursery school children 40 to 45 months of age were tested in labeling and paragraph conditions in a repeated measures design. The very poor performance of these children in the labeling condition and their almost perfect performance in the paragraph condition suggested that although they were not able to produce mediators on their own, they were able to use mediators supplied to them to facilitate their paired-associate learning. Both studies were taken as being consistent with previous findings that extended verbal elaborations facilitate the learning of children more than nonelaboration (labels) or simple sentences.

Verbal Elaboration in Children: Variations in Procedures and Design[1]

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University of Minnesota

In the last decade, since the initiation of verbal elaboration research (cf. Epstein, Rock, & Zuckerman, 1960; Jensen & Rohwer, 1963a, 1963b), the facilitative effects of various elaborations have been repeatedly documented. There have been few attempts, however, to test the relatively strong hypothesis proposed by Rohwer (1968) that the greater the extent of a verbal elaboration, the greater would be the resulting learning efficiency. A notable exception has been the work of Turnure (1971; Turnure & Thurlow, 1971b; Turnure & Walsh, 1971) which has attempted to relate the extensity of an elaboration to its relative efficacy in facilitating paired-associate learning.

In an initial study (Turnure & Walsh, 1971), it was found that items embedded in two-sentence paragraphs were learned significantly faster than those embedded in single sentences, which in turn were learned faster than items merely labeled or named by educable mentally retarded (EMR) children. Turnure (1971) then investigated the effects of four types of verbal elaboration (labels, sentences, and two types of paragraphs) on the acquisition and reversal of paired-associates by EMR children. The two paragraph types were included to examine the effects of differential placement of the response term in the two-sentence paragraphs. In the first type (Semantic), both stimulus and response terms were included in the first sentence,

while the second sentence provided additional verbal context. In the second paragraph type (Syntactic), the stimulus term occurred in the first sentence and the response term in the second. Turnure's results again indicated that both types of paragraph elaboration led to performance significantly superior to that of subjects given sentence elaborations. The paragraph types did not differ in their effectiveness, and no differences existed between any of the extended elaboration forms on a reversal task (R-S recall) following acquisition.

Subsequent studies (Turnure, Thurlow, & Larsen, 1971) replicated these findings with populations of "normal," or non-retarded children. Following these studies, however, it was noted that training times may have been confounded with the experimental conditions investigated. In a pilot study with nursery school children, experimental procedures called for the same training interval that Turnure had employed -- 7 seconds for each pair. Recordings of training times, which measured the actual amount of time taken by subjects to repeat each verbal elaboration (as opposed to measuring only the time the stimulus items were exposed, as in the previous studies; Turnure, 1971; Turnure et al., 1971; Turnure & Walsh, 1971), indicated that they differed with the condition. The longest time occurred in the Semantic paragraph condition (18.4 sec.), then the Syntactic paragraph condition (16.4 sec.), and last the Sentence condition (11.2 sec.). These training times were significantly different ($F = 10.7$; $df = 3, 41$; $p < .01$), and a Newman-Keuls procedure revealed that the paragraph conditions had significantly longer training times than the Sentence condition. The

two paragraph conditions were not significantly different in training times. These results directly paralleled those attributed to the condition effect in the Turnure (1971) and Turnure et al. (1971) studies. Because accurate measures of training times were not available in those studies, it is not clear that the effects obtained there were due exclusively to differences in the effects of the three forms of extended elaborations.

Recent studies (Thurlow & Turnure, 1971; Turnure & Thurlow, 1971b, Study I) have controlled training times, but have not served as adequate tests of Turnure's initial studies. Thurlow and Turnure found the only significant difference to be between the Semantic paragraph condition and the Sentence condition. These findings, however, were derived from a somewhat different learning task, with different dependent measures, and with somewhat different stimulus materials. A comparison of two-sentence and three-sentence paragraphs by Turnure & Thurlow found differences whose direction supported Rohwer's (1968) hypothesis, but only a few of a number of dependent measures being investigated showed condition differences to be statistically significant. The failure to find consistent differences between two and three-sentence paragraphs suggested that with strict control of timing measures, a replication of Turnure et al.(1971, Study II) might also fail to find significant differences between one-sentence and two-sentence structures.

Although the timing differences found with nursery school children might have exaggerated any timing differences that may have existed in Turnure's earlier studies (cf. Thurlow & Turnure, 1971), and since subsequent studies which have controlled training times have used some-

what different materials, procedures, and measures, a clarification of the effects of increasing the extensity of a verbal elaboration seemed desirable. The present study was thus designed to replicate, with controlled training times, the investigation of three extended verbal elaborations (Turnure et al., 1971, Study II).

Method

Subjects. Forty-two children attending art classes at the University of Minnesota were tested in two replications. Twenty-one children, tested during the summer, were matched on the basis of age and then randomly assigned to the three conditions (mean age = 6.4; range - 5.0 - 7.8). An additional 21 children, with the same age range, were tested in the Fall. These subjects were also matched on the basis of age and then randomly assigned to the experimental conditions (mean age = 6.3). There were no significant age differences between the two subject populations or between the three experimental conditions (both F's < 1). The subjects included here, however, were approximately 6 months younger than the children employed by Turnure et al. (1971, Study II).

Materials. Stimulus materials used were identical to those employed by Turnure et al. (1971). They consisted of 8 pictures of common objects which had been cut out of a preprimer workbook and which were individually mounted on white cardboard (8.9 x 6.4 cm). The specific pairs and the elaborations formulated for them by Turnure et al. were also employed in the present study.

Procedure. Except for timing, the procedures of Turnure et al.

(1971) were replicated. Three experimental conditions, in which the pairs were presented in either Sentences, Semantic paragraphs, or Syntactic paragraphs, were employed. These elaborations were presented to the subject only once, during a single training trial. In the training trial, the experimenter exposed the stimulus and response pictures together for 15 seconds. During this interval, he uttered the appropriate elaboration for the pair, and the subject repeated it. In the Sentence condition, the pairs were presented within short sentences relating the stimulus and response objects (e.g., The cup has soap in it). In both paragraph conditions, pairs were presented in two-sentence paragraphs. Semantic paragraphs were formed by placing both stimulus and response terms in the first sentence, with the second providing further elaboration (e.g., Hit the crayon with the hammer. That will break it). Syntactic paragraphs were formed by placing the stimulus term in the first sentence and the response term in the second (e.g., He is pulling the wagon. It is full of scissors). The training procedure was carried out once for each of the 8 pairs, with the specific pairs and their order of presentation being identical for all conditions.

Following training with all 8 pairs, acquisition trials were started immediately. For each pair, the stimulus picture was presented and the subject was asked to identify the name of the picture that was hidden behind it (i.e., the response term). If an incorrect response was given, or no response was given within 20 seconds, an error was scored. Following a response, or 20 seconds, the subject was shown the stimulus picture with its corresponding response picture

for five seconds. One trial consisted of the presentation of the 8 pairs in this manner. The order of presentation of the 8 pairs across trials was predetermined by random assignment, but the same order was used for every subject. In line with recent suggestions (Davidson & Dollinger, 1969; Rohwer, 1966) that a first trial performance measure might be more sensitive to the effects of elaboration training, acquisition performance was measured in terms of the number of first trial errors, as well as the number of trials to a learning criterion of two errorless trials.

Two reversal trials (16 pairs), in which the subject was required to give the name of the stimulus item when shown a picture of a response item, followed acquisition. The reversal task followed immediately upon completion of the acquisition task, without the subject being informed of any change in procedure. Reversal performance was scored in terms of the number of correct responses given by the subject.

Results

Mean trials to criterion and mean first trial errors for the three conditions are presented in Table 1. Analysis of trials to criterion for a one-way replicated experiment (using pooled error term) revealed the condition effect to be the only significant factor ($F=4.75$; $df=2,38$; $p < .05$); the replication factor was not significant ($F < 1$). Comparison of the condition means using a Newman-Keuls procedure indicated that subjects required significantly more trials to reach criterion in the Sentence condition than in either of the two

Table 1

Means and Standard Deviations of Trials to Criterion and First Trial Errors for Three Experimental Conditions

	Trials to Criterion	First Trial Errors
Sentence Condition		
$\bar{X}$	4.36	2.21
SD	2.17	1.12
Semantic Paragraph Condition		
$\bar{X}$	2.86	.92
SD	.86	1.00
Syntactic Paragraph Condition		
$\bar{X}$	3.00	1.50
SD	.68	1.22

paragraph conditions (p's < .05). The acquisition results obtained here, in terms of both means and standard deviations, are impressively similar to those obtained by Turnure et al. (1971). For the Sentence, Semantic paragraph and Syntactic paragraph conditions, Turnure et al. found mean trials to criterion scores of 4.25 (SD=1.82), 2.92 (SD=.79), and 2.33 (SD=.65), respectively. Although the direction of the difference between the two paragraph conditions is reversed in the present study, due to slightly poorer performance by the Syntactic paragraph group, the difference between the sentence and paragraph conditions is clear.

Analysis of first trial errors for a one-way replicated experiment revealed only a significant conditions effect ($F=4.53$; $df=2,38$; $p < .05$) as in the trial to criterion analysis. Further analyses of the condition means, by use of a Newman-Keuls test, revealed that Sentence condition subjects made significantly more errors than Semantic paragraph subjects ($p < .05$). Not only were there no significant differences between the two paragraph conditions, but the difference between the Sentence and Syntactic paragraph conditions failed to reach significance. Although the pattern of significant differences indicated here in this analysis is somewhat different from that found in trials to criterion analyses, the direction of the results confirms the general superiority of the paragraph conditions in facilitating performance (at least in a task of difficulty comparable to that employed here; cf. Thurlow & Turnure, 1971).

The numbers and percentages of subjects who performed perfectly in each group (see Table 2) were somewhat lower than those found in

Table 2

Numbers and Percentages of Subjects Exhibiting Errorless Acquisition Performance in Three Conditions

	Number	Percentage
Sentence Condition	1	7.1
Semantic Paragraph Condition	5	35.7
Syntactic Paragraph Condition	3	21.4

the Turnure et al. study, where the percentages of subjects performing errorlessly in the Sentence, Semantic paragraph and Syntactic paragraph groups were 25, 33, and 75%, respectively. The results do, however, support the finding of significant differences in the facilitative effects of sentence and paragraphs. Tests for differences between the proportions of subjects performing errorlessly revealed that only the Sentence and Semantic paragraph conditions were significantly different (z=2.79; p <.006). The direction of the results further suggested that both paragraph conditions had more errorless performers than the Sentence condition. The difference between the Sentence and Syntactic paragraph conditions, however, was not significant.

Reversal performance is presented in Table 3 in terms of the number of correct responses out of a possible 16. As is evident, there was very little difference in the reversal performances of the three elaboration groups. In fact, there appeared to be a strong ceiling effect on their performances -- all means approached the level of perfect acquisition (16 correct), and nearly all subjects showed perfect reversal performance. These results are strikingly similar to those obtained by Turnure et al. (1971, Study II), and a test of the proportion of "perfect reversers" in the sentence and combined paragraph conditions failed to find the difference significant (z = 1.88, n.s.).

Discussion

With timing procedures strictly controlled, the trials to criterion

Table 3

Means and Standard Deviations of Number Correct on Reversal and Percentages of Subjects Performing Errorlessly in Three Conditions

	Number Correct		Perfect Reversal	
	$\bar{X}$	SD	n	%
Sentence Condition	15.43	1.34	10	71.4
Semantic Paragraph Condition	15.93	.27	13	92.8
Syntactic Paragraph Condition	15.93	.27	13	92.8

data from the present study provided a striking replication of the original Turnure et al. (1971) data. In both studies, the only significant effect was a Conditions effect, with subjects in the paragraph conditions requiring significantly fewer trials to reach criterion than the subjects in the sentence condition. Neither this study, nor the Turnure et al. (1971) study found any significant differences between the two paragraph conditions. Somewhat different results emerged, however, in terms of first trial errors. These data indicated that only the subjects in the Semantic paragraph condition performed at a level superior to those in the Sentence condition; the performance of subjects in the Syntactic paragraph condition was not significantly different than either of the other two groups. The direction of the results on both measures, however, was clearly consistent with that of the Turnure et al. study -- subjects presented pairs within the context of a two-sentence paragraph generally made fewer errors and required fewer trials to reach criterion than subjects who had been presented the pairs within the context of a single sentence.

It is difficult, at this point, to explain the differential results obtained from the two dependent measures. Past investigators (Davidson & Dollinger, 1969; Rohwer, 1966) have indicated that first trial errors is more sensitive as a measure of the effects of elaboration training. In the present study, however, this did not seem to be the case. The trials to criterion measure revealed differences between the Syntactic paragraph condition and the Sentence condition, while the first trial error measure did not.

Recent studies have pointed to the importance of various meaning or relational characteristics of elaborations (Bobrow & Bower, 1969; Bower, 1970; Turnure & Thurlow, 1971b), and suggest that something other than just the extensity of an elaboration should be considered in any attempt to delineate the characteristics of effective elaborations. It seems that in typical paragraphs and sentences, the former, perhaps because of their greater length, have those relational characteristics which make them more facilitative elaborations. This is not to say that sentences cannot be developed which are as good, or even better than paragraphs. In fact, this seems to happen occasionally in the sentences and paragraphs devised here and in other studies (cf. Turnure & Thurlow, 1971b). Rather it seems that if there is no special effort made to equate the relational value of sentences and paragraphs, the paragraphs will generally result in performance superior to that from sentences. Whether this should be attributed to the greater length of the paragraph or to the better relational connections which develop because of its greater length, has not been adequately tested at this time.

One possible explanation of the somewhat lower number of subjects performing errorlessly noted in the present study, as compared to that observed by Turnure et al. (1971), may be the six-month age differential of the two subject populations. Support for this explanation is limited, however, since no correlation was found between performance and age in the present study, and since previous studies have found that any age differences which may exist in control (labeling) conditions tend to

disappear when syntactic mediators are provided (cf. Fuld, 1970). Furthermore, tests of digit span memory and memory for words (cf. Clay, 1971) typically indicate that a 4-pair list, like that in the present study, is well within the short-term memory span of those subjects tested here. On closer examination, it appears that the poorer performance of subjects in the Sentence and Syntactic paragraph conditions, at least in terms of the percentage of subjects performing errorlessly, does not accurately reflect the performance levels of the two groups. Although 13 subjects made errors in the Sentence condition and 11 did so in the Syntactic paragraph condition, only 7 of these Sentence subjects and 3 of these Syntactic paragraph subjects made more than 2 errors on the first trial.

As noted in the previous study (Turnure et al., 1971) reversal performances were nearly perfect in all conditions. As noted in numerous other studies (Thurlow & Turnure, 1971; Turnure, 1971; Turnure & Thurlow, 1971a, 1971b; Turnure & Walsh, 1971), it appears that once meaningfully related items are organized and stored in memory, they are available for retrieval and use in any sequence, regardless of the context in which they were originally presented.

Study II

Verbal elaboration procedures have proven to be effective over wide ranges of task difficulty and for many different levels of development. Remarkable paired-associate performances have been noted even in young nursery school children (3.8 years) supplied with verbal

elaborations (Turnure et al., 1971, Study III). It appears that very young children are capable of comprehending the task and performing mediational activities when appropriate elaborations are given to them. Various studies, however, have suggested that the degree of facilitation resulting from verbal elaboration reflects a developmental function (Jensen & Rohwer, 1965; see also Jensen, 1966; Turnure & Thurlow, 1971b). It may be that at some early point in the process of the child's language development there is an age at which experimenter-constructed elaborations are not effective. It becomes important, therefore, to investigate the lower age limits at which elaborative contexts facilitate paired-associate learning.

Turnure et al. (1971, Study III) investigated the effects of age on the facilitation provided by elaborative contexts. They found that a group of young children given paragraphs relating picture-pair items took significantly less time to learn a list of 4 pairs than did a group of young children told only to repeat the names of the paired items. The younger subjects in their study, whose CAs ranged as low as 40 months, seemed to be the youngest children for whom the efficacy of syntactic elaboration had been tested (see, however, a study by Fuld, 1970). Once again, however, the generality of the findings is limited because of the possible differential training times in the labeling and paragraph conditions (see Study I, this report). The purpose of the present study, therefore, was to confirm the findings of Turnure et al. by examining the relative effects of labels and paragraphs with training times strictly controlled. A

repeated measures design was employed.

Method

Subjects. Eight younger nursery school children were employed as subjects in a repeated measures design. Four subjects (42 - 44 months) from a private nursery school in St. Paul, and four (40 - 45 months) from a University-connected nursery school in Minneapolis were assigned randomly to the two experimental groups. Testing of the subjects from the first school took place approximately four months before the testing of the subjects from the second school.

Materials. Twenty-four colored pictures of common objects were cut from a preprimer workbook and mounted on white cardboard (8.9 x 6.4 cm). From these pictures, 12 pairs were randomly formed with the restriction that no obvious or common relations of sound or meaning existed between the members of a pair. For each pair, a Semantic paragraph elaboration was constructed. From the 12 pairs, two 6-pair lists were formed. It was decided that a 6-pair list should be used rather than the 4-pair list employed by Turnure et al., since strong ceiling effects were noted in the paragraph condition of that study.

Procedure. Two experimental conditions were used to test the effectiveness of syntactic constructions in facilitating the paired-associate performance of young nursery school children. In the first condition, referred to as the Labeling condition, subjects were shown the stimulus and response pictures together for 15 seconds and were asked to repeat the pictures' labels twice. In the second condition, the Paragraph condition, the subjects received a training trial in

which they were shown the stimulus and response pictures together for 15 seconds and were asked to repeat the paragraph elaboration which had been constructed for each pair. After the training trial, all subjects were given the same learning task. Each subject was required to give the name of the response picture which corresponded to the stimulus picture he was shown. If the subject made an incorrect response, or if he did not respond within 20 seconds, an error was scored. Following a response, or 20 seconds, the stimulus and response pictures were shown together for five seconds. This procedure was carried out with all pairs for two acquisition trials. The order of the pairs was altered on each trial to eliminate possible serial learning effects. The number of errors made on these two trials was taken as the measure of acquisition performance.

Following the two acquisition trials, all subjects were given two reversal trials. During these trials, the subject was shown the response picture and he was to name the corresponding stimulus picture. The subject was not told of the reversal and the task continued as if no alteration had taken place.

Each subject received both experimental conditions, Labeling and Paragraphs, separated by a period of one week. In each school, two of the subjects (Group I) received the Labeling condition the first week and the Paragraph condition the second (L-P); the other two subjects (Group II) were exposed to the Paragraph condition the first week and the Labeling condition the second (P-L). List order was counterbalanced within both groups of subjects. The

primary objective of the present study was to compare the performance of the same subjects in the Labeling and Paragraph conditions.

Results

Data from the two schools were analyzed using a complex Latin square design (Bruning & Kintz, 1968). Analysis of the number of acquisition errors revealed the conditions effect to be the only significant factor ($F = 136.32$; $df = 1,2$; $p < .01$); both the school and order effects, as well as all the interaction effects, were nonsignificant. Table 4 presents the mean number of acquisition errors made in each experimental group. Clearly, subjects performed at a superior level when in the Paragraph condition as compared to the Labeling condition, regardless of the school they attended or the order in which they received the conditions.

Analysis of reversal performance using a complex Latin square design also revealed a significant conditions effect ($F = 25.49$; $df = 1,2$; $p < .01$); again, the effects of school, order, and all interactions were nonsignificant. The reversal data are presented in Table 5 and again indicate the powerful facilitative effects of presenting pairs within a paragraph context.

Discussion

These results provide quite striking support for the suggestion that very young children are able to use language to mediate associations between items. Although they may not at this time be capable of formulating their own effective mediators (as suggested

Table 4

Means and Standard Deviations of Acquisition Errors for Two Treatment Groups in Each School

	S_1		S_2	
	Day 1	Day 2	Day 1	Day 2
Group I (L-P)	Labeling:	Paragraphs:	Labeling:	Paragraphs:
$\overline{X}$	12.0	1.5	12.0	0.0
SD	0.0	0.7	0.0	0.0
Group II (P-L)	Paragraphs:	Labeling:	Paragraphs:	Labeling:
$\overline{X}$	2.5	9.0	3.0	8.0
SD	2.1	1.4	1.4	1.4

Table 5

Means and Standard Deviations of Reversal Errors

for Two Treatment Groups in Each School

	S_1		S_2	
	Day 1	Day 2	Day 1	Day 2
Group I (L-P)	Labeling:	Paragraphs:	Labeling:	Paragraphs:
$\overline{X}$	10.0	0.0	10.5	1.0
SD	2.8	0.0	2.1	0.0
Group II (P-L)	Paragraphs:	Labeling:	Paragraphs:	Labeling:
$\overline{X}$	1.0	6.5	2.5	10.0
SD	1.4	3.5	0.7	2.8

by the poor performance of these subjects in the Labeling condition, and by the work of Jensen and Rohwer (1965; see also Fuld, 1970), when given effective mediators (i.e., verbal elaboration), their paired-associate performance is greatly facilitated. This is true for both forward and reversed associations. Even with 6 pairs to learn, the eight subjects were able to correctly respond to 79% of the pairs on the first acquisition trial, and to 87% of the pairs on the first reversal trial. This is comparable to the performance of the younger subjects studied by Turnure et al. (1971, Study III) with a list of 4 paired-associates (Acquisition - 75%, Reversal - 78%). In contrast, when in a Labeling condition, the same subjects were able to respond correctly to only 10% and 15% of the first trial acquisition and reversal pairs, respectively. This level of performance is somewhat lower than for subjects given only four pairs to learn (Acquisition - 41%, Reversal - 41%; Turnure et al., 1971), suggesting that paragraph training allows the subject to overcome increases in task difficulty which would normally serve to decrease the level of paired-associate performance.

The repeated measures design produced no carryover effects. This observation is consistent with results of studies of transfer of elaboration training which consistently show no effects of merely one day of training. (Jensen & Rohwer, 1963a; Milgram, 1967; Turnure, Larsen, & Thurlow, 1971, Study II; Turnure & Thurlow, 1971a). It should be noted that there is good evidence of such elaboration transfer following two days of training (Turnure, Larsen, & Thurlow, 1971, Study II; Turnure & Thurlow, 1971a; Turnure & Walsh, 1971) at least

with retarded children. It would be of interest to determine at what early age similar transfer effects might be found with young normal children. Of course the earliest age at which the differential effects of paragraph elaboration over labeling may obtain has probably not been identified as yet.

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Footnote

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